DRAINAGE REPORT

RAINIER COMMONS
PROJECT NO. 2409565

BY

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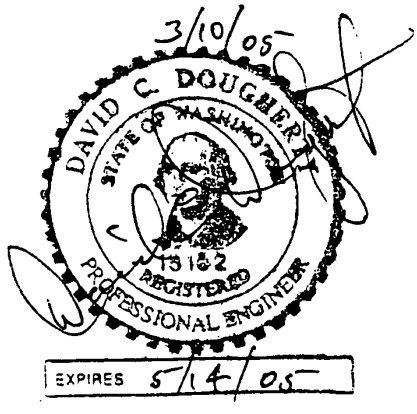

INTRODUCTION

The enclosed calculations provide the basis for the design of the sediment storage tanks, and the permanent Stormceptor water quality treatment systems. Sediment ponds are not proposed for sediment removal during construction, as the site slopes too steeply and there is inadequate level area. Thus, runoff will be pumped into tanks located at each end of the project. The sediment storage is based on a 2 year storm as directed by the staff. The ground cover is assumed to be bare earth.

As requested by staff, calculations have been provided for the Stormceptors, which are proposed to collect sediment from the site in the permanent condition. The basin data is provided for a water quality storm, which, as directed by the staff, is a rainfall of 1.08 inches. The actual design is done using the Stormceptor program, which considers the project area and the total area and impervious area. The model selected is an STC 900, which provides a 93% to 94% TSS removal.

SEDIMENT TANK SIZING

Raindrop Commons

Calc 2 yr Storm: (for Construction)

Rainfall: $P_2 = 4.68"$ (Per city Policy)

Assume bare earth ground cover
CN = 89 (See attached curve No. Table)

Use Minimum Time of Concentration:

6.3 min

Areas: (To be disturbed)

North: 0.99 Ac (North of Bldg 25)

South: 0.57 Ac (South " " ")

Results:

North: Vol = 0.0635 Ac-Ft
= 2,766 cu ft ←

South: Vol = 0.0365 Ac-Ft
= 1,590 cu ft ←

TABLE 3.5.2B SCS WESTERN WASHINGTON RUNOFF CURVE NUMBERS

SCS WESTERN WASHINGTON RUNOFF CURVE NUMBERS (Published by SCS in 1982)					
Runoff curve numbers for selected agricultural, suburban and urban land use for Type 1A rainfall distribution, 24-hour storm duration.					
LAND USE DESCRIPTION		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP A	B	C	D
Cultivated land(1):	winter condition	86	91	94	95
Mountain open areas:	low growing brush and grasslands	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	undisturbed or older second growth	42	64	76	81
Wood or forest land:	young second growth or brush	55	72	81	86
Orchard:	with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping.					
good condition:	grass cover on 75% or more of the area	68	80	86	90
fair condition:	grass cover on 50% to 75% of the area	77	85	90	92
Gravel roads and parking lots		76	85	89	91
Dirt roads and parking lots		72	82	87	89
Impervious surfaces, pavement, roofs, etc.		98	98	98	98
Open water bodies:	lakes, wetlands, ponds, etc.	100	100	100	100
Single Family Residential (2)					
Dwelling Unit/Gross Acre	% Impervious (3)				
1.0 DU/GA	15				
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
Planned unit developments, condominiums, apartments, commercial business and industrial areas.	% impervious must be computed				
		Separate curve number shall be selected for pervious and impervious portion of the site or basin			

(1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, August 1972.
(2) Assumes roof and driveway runoff is directed into street/storm system.
(3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.

STORMSHED DATA

constr-N Event Summary: (North)

BasinID	Peak Q	Peak T	Peak Vol	Area	Method	Raintype	Event
------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
constr-N	0.16	8.00	0.0635	0.99	SBUH/SCS	TYPE1A	2 yr

Drainage Area: constr-N

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.9900 ac	89.00	0.11 hrs	
Impervious	0.0000 ac	0.00	0.00 hrs	
Total	0.9900 ac			

Supporting Data:

Pervious CN Data:

North	89.00	0.9900 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Fixed	Construction Runoff	0.00 ft	0.00%	6.3000	6.30 min

constr-S Event Summary: (South)

BasinID	Peak Q	Peak T	Peak Vol	Area	Method	Raintype	Event
------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
constr-S	0.09	8.00	0.0365	0.57	SBUH/SCS	TYPE1A	2 yr

Drainage Area: constr-S

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.5700 ac	89.00	0.11 hrs	
Impervious	0.0000 ac	0.00	0.00 hrs	
Total	0.5700 ac			

Supporting Data:

Pervious CN Data:

South	89.00	0.5700 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Fixed	Construction Runoff	0.00 ft	0.00%	6.3000	6.30 min

STORMCEPTOR SIZING

Rainier Commons

Size Stormceptors for Water Quality Storm:

$P_2 = 1.08"$ (Per City Policy)

Areas:

North:

Impervious, $A_i = 0.40\ Ac$

Pervious: $0.59\ Ac$ ($CN = 86$)

Total: $0.99\ Ac$

South:

Impervious, $A_i = 0.29\ Ac$

Pervious: $0.28\ Ac$ ($CN = 86$)

Total: $0.57\ Ac$

Time of Concentration, T_c:

Due to extent of impervious area and piped runoff, assume T_c is minimum value of 6.3 min.

WATER QUALITY STORMS FOR STORMCEPTOR SIZING

north-WQ Event Summary: (North)

BasinID	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-ft)	Area ac	Method /Loss	Raintype	Event
north-WQ	0.10	8.00	0.0407	0.99	SBUH/SCS	TYPE1A	WQ Storm

Drainage Area: north-WQ

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.5900 ac	86.00	0.11 hrs	
Impervious	0.4000 ac	98.00	0.01 hrs	
Total	0.9900 ac			

Supporting Data:

Pervious CN Data:

North Pervious	86.00	0.5900 ac

Impervious CN Data:

Surfaced Areas	98.00	0.4000 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Fixed	Construction Runoff	0.00 ft	0.00%	6.3000	6.30 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Fixed	Fixed Value	0.00 ft	0.00%	0.3000	0.30 min

south-WQ Event Summary: (South)

BasinID	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-ft)	Area ac	Method /Loss	Raintype	Event
south-WQ	0.07	8.00	0.0266	0.57	SBUH/SCS	TYPE1A	WQ Storm

Drainage Area: south-WQ

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.2800 ac	86.00	0.10 hrs	
Impervious	0.2900 ac	98.00	0.01 hrs	
Total	0.5700 ac			

Supporting Data:

Pervious CN Data:

South Pervious	86.00	0.2800 ac

Impervious CN Data:

Surfaced Areas	98.00	0.2900 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Fixed	South Pervious	0.00 ft	0.00%	6.0000	6.00 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Fixed	Fixed Value	0.00 ft	0.00%	0.3000	0.30 min

Stormceptor Sizing Table

Version 3.0.0

North

Selected Rainfall Station	
State	WASHINGTON
Name	SEATTLE PORTAGE BAY
ID #	7458
Elev. (ft)	19
Latitude	N 47 deg 39 min
Longitude	W 122 deg 18 min

Site Parameters	
Total Area (ac)	.99
Imperviousness (%)	40
Impervious Area (ac)	.40

Particle Size Distribution

Diameter (um)	Percent (%)	Velocity (ft/s)
20	20.0	0.0013
60	20.0	0.0052
150	20.0	0.0351
400	20.0	0.2116
2000	20.0	0.9416

Note : Sizing Results vary with particle size distribution. BMP comparisons must use the same particle size distribution. Please call (800) 909-7763 for sizing with other distributions

Stormceptor Sizing Table

Stormceptor Model	% Runoff Treated	% TSS Removal
STC 450i	97.7	88.9
STC 900	99.8	93.3
STC 1200	99.8	93.5
STC 1800	99.8	93.8
STC 2400	100.0	95.3
STC 3600	100.0	95.8
STC 4800	100.0	96.8
STC 6000	100.0	97.0
STC 7200	100.0	97.7
STC 11000	100.0	98.4
STC 13000	100.0	98.5
STC 16000	100.0	98.8

Comments :

Stormceptor Sizing Table

Version 3.0.0

South

Selected Rainfall Station	
State	WASHINGTON
Name	SEATTLE PORTAGE BAY
ID #	7458
Elev. (ft)	19
Latitude	N 47 deg 39 min
Longitude	W 122 deg 18 min

Site Parameters	
Total Area (ac)	.57
Imperviousness (%)	51
Impervious Area (ac)	.29

Particle Size Distribution

Diameter (um)	Percent (%)	Velocity (ft/s)
20	20.0	0.0013
60	20.0	0.0052
150	20.0	0.0351
400	20.0	0.2116
2000	20.0	0.9416

Note : Sizing Results vary with particle size distribution. BMP comparisons must use the same particle size distribution. Please call (800) 909-7763 for sizing with other distributions

Stormceptor Sizing Table

Stormceptor Model	% Runoff Treated	% TSS Removal
STC 450i	99.0	90.2
STC 900	99.9	94.3
STC 1200	99.9	94.4
STC 1800	99.9	94.7
STC 2400	100.0	96.1
STC 3600	100.0	96.5
STC 4800	100.0	97.4
STC 6000	100.0	97.6
STC 7200	100.0	98.1
STC 11000	100.0	98.7
STC 13000	100.0	98.8
STC 16000	100.0	99.1

Comments :